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THE

# Journal of the Society of Arts,

AND OF

THE INSTITUTIONS IN UNION.

110th Session.] FRIDAY, SEPTEMBER 30, 1864. [No. 619. Vol. XII.

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## Proceedings of the Society.

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### EXAMINATION PAPERS, 1864.

The following are the Examination Papers set in the various subjects at the Society's Final Examinations, held in April last:—

(*Concluded from page 705.*)

### FREE-HAND DRAWING.

THREE HOURS ALLOWED.

*Candidates are not required to attempt all the subjects given in this paper, but may select those which are most in accordance with their art education.*

Make a life-size drawing from the head of the model.
Draw one of the hands the size of life.
Make an outline of the whole figure eighteen inches high.
Design a pattern for a picture frame.
Make an original composition of Wrestling.

---

Directions for the Local Boards.

Let an old man or a boy be placed in an easy attitude before the candidates as a model for them to draw from.

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### GEOMETRICAL DRAWING.

THREE HOURS ALLOWED.

The constructions must be accurate, and show clearly, by plain and dotted lines, with appropriate letters of reference, the principles on which they are based. They may be put in ink, or left in pencil, at the discretion of the candidate, provided they are distinct.

No deviations from the conditions of the questions can be admitted; and since no candidate must answer more than two questions from any one section, he is advised not to attempt more than the time will admit of his completing, since little or no credit will be given for incompleted or inaccurate answers.

I.

1. Describe a circle of 1 inch radius, *inscribe* and *circumscribe* two equilateral triangles, having the *opposite* sides parallel.

2. Draw a square of 2·5 inches side, and inscribe six others in succession, each having its corners in the middle of the sides of the preceding one: verify the construction by drawing the four diagonals common to the successive squares.

3. Draw two equal squares of 4 inches side, having a common centre, the sides of the one being parallel to the diagonals of the other: complete the eight small squares having for one of their diagonals the middle segment of each side of the larger squares.

4. Draw a quadrant of a circle of 2 inches radius with a tangent parallel to either radius, divide the quadrant into six equal arcs, and draw radii through the points of division, produced to meet the tangent; measure and write down the lengths of four of the intercepted segments from the point of contact of the tangent.

II.

1. Construct a triangle with its sides 3, 4, 5 inches, and draw the inscribed and circumscribed circles.

2. Make a square or an equilateral triangle equal to the above triangle.

3. Determine by construction the longest side of a triangle similar to that of No. 1, but of three-quarters its area.

4. A line 3·85 inches long is to be divided into two segments, so that the area of the rectangle contained by them may be three inches.

III.

1. Draw the curve called an "oval" made up of arcs of circles described with different radii, longest and shortest diameters being 3 and 2 inches.

2. Draw the curve traced by a point moving from the centre of a circle, so that the distance increases in the same ratio as the angle contained by a radius through the point, and any fixed radius.

3. Draw the curve traced by the end of a string gradually unwound from the circumference of a circle of 1·5 inches radius.

IV.

1. Three lines, 3 inches long, meet in a point, each is at right angles to the other two, and two of them are inclined at 30° and 50° to the paper; represent these lines in plan and elevation.

2. An equilateral triangle of 2·5 inches side rests with one corner on the paper, the other two 1 and 2 inches above it: show it in a plan and elevation.

3. The plane of a square of 2·5 inches side is inclined to the paper at 60°, and two corners of the square are 1 and 2 inches above the paper: show it by a plan and elevation.

V.

1. A prism 5 inches long, its base a hexagon of 1·5 inches side, is cut obliquely by a plane inclined at 70° to one face and cutting off 2 inches in length of that face. Show the remainder by a plan and elevation:—

*a.* In any position at pleasure, or
*b.* When lying horizontally on its longest face.

2. Draw the real form of the section made by the oblique plane.

3. Draw the figure which if cut out and properly folded would form the prism thus shortened.

4. A square prism 4 inches long and 1·5 inches side is ended, by a pyramid 2·5 inches high with the same base. Show this solid by a plan and elevation when its edges are vertical and one face is inclined at 30° to the plane of elevation. Or,

5. When one face of the *pyramid* lies on the paper.

6. Draw the figure which if cut out and properly folded would form this solid.

### VI.

1. An oblique cone 3·5 inches high, radius of base 1 inch, the apex being vertically over a point in the circumference of base: draw a plan and elevation when lying on any side, provided it is not the shortest.

2. Determine the plane which would cut this cone in a circle of ·75 inches radius.

3. Draw the figure which if cut out and rolled up would form the surface of this cone.

4. Three spheres of 1, ·75, ·5 inch radii lie on the paper, each touching the other two; determine a line in which a plane touching all three would cut the paper.

### VII.

1. A block of wood 5 inches long, 3 wide, and 2 inches thick, with all its corners cut off at ·75 inches along each, as to be represented—

1. In Isometrical projection, or
2. In Perspective projection, the plane and distance of the picture, and position of the block being taken at pleasure, provided no face is parallel to the plane.

2. A cylinder, 1 inch radius and 4 inches long, is to be shown—

1. In Isometrical projection, or
2. In Perspective projection, with the same conditions as before.

## THEORY OF MUSICAL GRAMMAR.

### I. Rudiments of Musical Grammar.

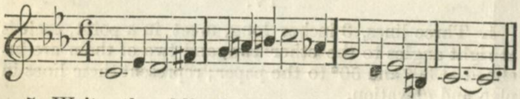
(*Nos.* 1 *to* 6 *must be answered* on music paper, *and in the order of the questions.*)

1. Write the scales of *Mi* (E) and of *Mi* flat (E flat), with the essential sharp or flat before each note.

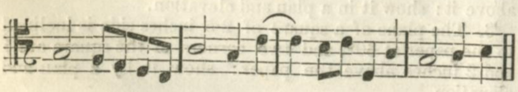
2. Write the scales of *Si* (B) and of *Do* (C) *minor*, in every form with which you are acquainted.

3. Write *Sol* (G) and the minor third above it, *La* (A) and the tritone above it, and *Si* (B) and the imperfect fifth above it.

4. Transpose the following into *Si* (B) minor, and write it in $\frac{6}{8}$ time:—



5. Write the following on the bass stave, at the same pitch:—



6. Write a bar or two in every kind of time with which you are acquainted.

7. What is a musical *phrase?*

8. What is a chromatic interval?

### II. Harmony, Counterpoint, and Musical History.

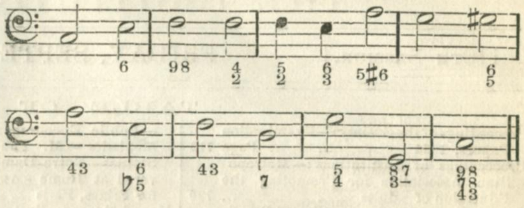
1. Which are the *fundamentals* of a scale or key?

2. How does a fundamental discord differ from a discord by suspension?

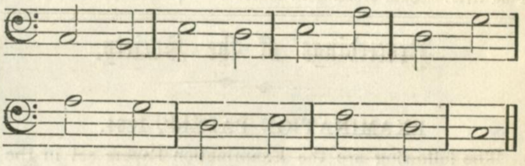
3. When are two following combinations said to be *connected?* Give examples of two connected and of two unconnected combinations.

4. State anything you know about English music in the seventeenth century.

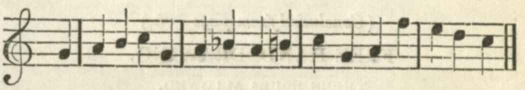
5. Add three parts to the following:—



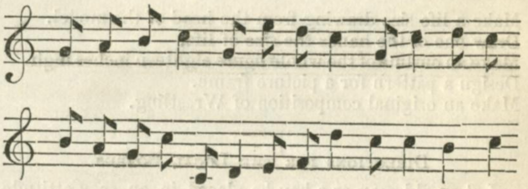
6 Add a part, or any number of parts, in any species of counterpoint, above or below the following:—



7. Harmonise the following.—



8. Divide the following into bars, so that it will form a connected melody. *Group* the quavers.



## Proceedings of Institutions.

Metropolitan Association for Promoting the Education of Adults.—The Programme of the Examinations, to be conducted by this Association in 1865, has just been issued. An Examination in Plain Needlework will be held on Saturday, March 4, 1865, for the female members of the institutions in union. The Examinations in Elementary Knowledge, being the previous Examinations required by the Society of Arts, will be held in March. Her Royal Highness the Princess of Wales, the Patroness of the Association, has been graciously pleased to intimate her intention to give annually a Bible of the value of three guineas, together with two guineas in money, as a Prize to the Female Candidate who obtains a Certificate of Proficiency in Plain Needlework, and the highest marks in the Examinations in Elementary Knowledge, Higher Grade. The Special Examination in Religious Knowledge, established by the Asssociation for the Members and Students of Classes in Institutions and Schools in Union with it, is annually held, under the superintendence of its Local Boards, and the Certificates and Prizes are awarded by the Examiners appointed by the Lord Bishops of London and Winchester. Candidates for these Examinations must be at least twelve years of age, and must have previously received from this Association, or from a Local Board connected therewith, or with the Society of Arts, a Certificate or "Pass" for proficiency in Reading, Writing, Simple Arithmetic, and Spelling. Candidates of the Higher Grade will receive a certificate signed by the bishop of the diocese. Candidates of the Lower Grade will receive a certificate signed on his behalf, and by his authority, by his chaplain. In 1865 this Examination will be held on April 11th. The Short-hand Examination is fixed for May 9th. The Committee, recognising the great importance to the working classes of a practical knowledge of Domestic Economy and the Laws of Health, have suggested a course of study in these subjects, and announce their intention to hold an Examination on May 16th. This Examination is intended to be preparatory to the Final Examination in Domestic Economy by the Society of Arts; the questions to be proposed by the Examiner appointed by the Association will be simple and practical. To be entitled to Certificates, the Female Candidates will not be required to obtain more than two-thirds of the number of marks required of the Male Candidates. The Examination papers will also contain a sufficient number of questions within the range of study particularly adapted to females, so as to enable them to obtain Certificates apart from a knowledge of those subjects specially within the competency of males. The following subjects are included in the Syllabus:—Such familiar notions of the rudiments of Science as are necessary for understanding the laws of health and the principles of common domestic processes; for appreciating the relative value of household articles in common use; and for detecting defective quality, adulteration, or fraud. The essential characteristics of a healthy and comfortable dwelling, as exemplified by some of the improved dwellings recently provided in the Metropolitan District. Useful knowledge concerning building materials, fittings, and furniture. Fabrics and Clothing. Adaptation of dress to weather, occupation, and means; effects of tight clothing. Elementary information concerning the food resources supplied by the animal and vegetable kingdoms; their judicious selection, preparation, &c. Use and abuse of condiments, beverages, &c. Household stores, and appliances for warming, lighting, cleaning, ventilation, and the prevention of noxious influences. Simple rules for the preservation and restoration of health; for the comfort of the sick; for safety from accidents; and for relief in cases of sudden injury. The use of weights and measures, and the keeping of household accounts. Easy instruction concerning Savings Banks, Provident Societies, &c. Prizes to the amount of Twelve Pounds are offered, through this Association, by the Committee of the Ladies' Sanitary Association, and will be selected by the successful Candidates from a list of books sanctioned by the Committee. A course of six lectures on the subjects named in the Syllabus, illustrated with diagrams, specimens, &c., from the Economic Museum at Twickenham, kindly lent by Mr. T. Twining, will be delivered at various Institutions in Union with this Association, by lecturers engaged by the Ladies' Sanitary Association. The Local Boards will also conduct the Final Examinations of the Society of Arts, in conformity with the regulations laid down by the Council.

## ON THE FIRE-PROOF CONSTRUCTION OF DWELLINGS.

By Henry M. Eyton, Esq., Architect.

In the report addressed to the Council of the Society of Arts, entitled "The Statistics of Model Dwellings,"[*] one of the heads on which further information was considered desirable, was Fire-proof Construction, its best examples and their cost.

With the view of adding some little information under the above head, I have noted down some of the many fire-proof inventions, in the hope that in the valuable researches that are now being made by men of ability into the best means of improving the condition of the poorer classes of the population through the salubrity and cheerfulness of their dwellings, the increased danger necessarily attending the aggregation of several families under one roof may claim that share of their attentive consideration which is commensurate with its importance, as most of the improved buildings are now erected with wooden joists and floors, and some with even wood stairs, built, as stated in an article of the *Builder* of June 7, 1845, and again, November 4, 1848, "as if to burn." "Houses so arranged that if once on fire there is little chance of staying its progress; being, in fact, a mere bundle of sticks piled up;" and also, quoting from a pamphlet written in 1775, "that among a society of men so sensible, so learned, and ingenious, there never was a single idea or the plan of an hour's thought adapted to secure the building or family, who were continually surrounded by and living in the middle of combustible wood, from falling a sacrifice to the most trifling accidents of fire, which building and family lieth every night in the year at the mercy of a drunken fellow with the snuff of a candle, a handful of shavings lying in a bye corner, a little thoughtless boy and girl, or a sleepy servant-maid drying linen at the kitchen fire, besides many malicious accidents, to be entirely burnt down and consumed before the morning. Many people wonder that a strong built house should be so easily consumed, but this wonder ceases when they consider that everything about us is liable to catch fire; our houses are floored, our rooms partitioned, and the roof covered, with fir, a wood full of turpentine, and enriched with two or three coats of painting in oil, besides all our furniture, naturally made of wood, without the least material or contrivance to check the fury of fire, or prevent its rapid progress."

The Building Act merely deals with "Dwelling-houses for separate families containing more than 125,000 cubic feet," which it compels to have fire-proof stairs and landings, and with rooms tenanted by different persons if contained in a building exceeding three thousand six hundred square feet in area, where they are to be divided so far as they adjoin vertically by party walls, and so far as they adjoin horizontally by party arches or fire-proof floors; and although large buildings can be erected without either fire-proof stairs or floors, yet even these two sections are avoided by erecting one building in separate blocks, as was done by Mr. Gibbs, near Victoria-street, and by Alderman Waterlow, in Finsbury. In both of these buildings wood joists and floors have been employed. In all the buildings erected by the Labourers' Friend Society under Mr. Henry Roberts's superintendence, hollow brick arch floors have been used; and in the Portpool-lane buildings this plan has been put to a severe test, as will be seen by the following extract from the *Builder*:—

"Few of the large fires which have lately happened in the metropolis have been so extensively and rapidly destructive as that which has occurred in Portpool-lane, and an examination of the ruins shows the great danger which there is in keeping such immense stores of combustible materials in the centre of a dense population as are often found.

"Nothing could be more complete than the destruction which in a very short time took place over a large area. On the west side of the area of the fire are the "Thanksgiving" Model Lodging Houses; on the north, Reid and Co.'s immense brewery; on the south are closely-packed ranges of poor dwellings, every room of which is thickly inhabited; on the east there are houses of a similar class. Fortunately, on all sides, except that on which the model houses stand, there was a considerable extent of walls, without openings, exposed to the raging of the fire.

"The Portpool-lane model buildings are fire-proof. The rooms are arched with brickwork; the stairs and railings of slate, stone, and iron; the window-frames were of wood, but these the firemen cut away with their axes. The roof has been partly burnt, and if this building had been constructed on the usual plan, there is little doubt but that it would have been destroyed, for the flames rushed in at the windows, and swept along the ceilings of the rooms. The inmates have been put to inconvenience, but their furniture has not been injured by the fire. In other directions the poor people have suffered, and, what is much to be lamented, thirty-six joiners have lost their tools, which, we are told, on the average, were worth about £30 to each man. In this way £1,080 has been lost, and the calamity will deprive most of these men of the means of providing for their families, for we hear that few had thought of insuring the property on which themselves, wives, and children, so materially depended."

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[*] *Journal*, Vol. XII., p. 91.

It must be universally admitted that to secure comparative immunity from fire in ordinary dwelling-houses is a great desideratum, where even the resident is afforded the security of party walls and parapets of fire-proof material, guarding him from the carelessness of a neighbour. Of how much more importance then must it be where no such security exists, with a neighbour above and a neighbour below, all under the same roof, divided by floor joists and boarding of timber, and in some cases with wood stairs. A fire in such a building must inevitably involve a whole number of families in one common disaster.

But not only for this chief reason, the security to life and limb, ought the dwellings of the poor to be rendered incombustible. They should all be sound proof, in order to avoid the annoyance of the noise made by children, and the heavy tramp of the adult over head, wearying and disquieting at all times, but becoming intolerable in time of sickness. The solid incombustible material which would form an effectual barrier against the progress of fire, from its nature is equally a non-conductor of sound, and as perfectly isolates the tenant of one room from the rooms above and below him, as if he were living in an independent tenement.

Another, and not unimportant advantage, is secured by this method of construction. The floors are almost wet proof, and the upsetting of a tub of water does not affect the inmates below. A third advantage is, that all these constructions form no harbour for vermin.

Before proceeding to notice the several systems in existence, it will be well, for the sake of clearness, to classify the different modes of fire-proof construction under two heads, viz., brick, and concrete and iron. Commencing with brick, the most simple system is the half-brick arch. This has been employed at the model dwellings at Birkenhead. The arches were tied together with iron tiles, and abutted in the centre on an iron beam; the spaces between the upper surface of the arches and the spandril were filled in with concrete, on which flat tiles were imbedded. The arches were 7 feet span, with a rise of 7 inches, forming a thickness at the crown of 13 inches. The cost of this system would, including iron girders and tile floor, be about £5 per square; if boarded, and the underside made flat and lath and plastered, £7 10s. to £8.

### Hollow Bricks.

Mr. H. Roberts, in erecting the model dwellings at Streatham-street and Portpool-lane, used hollow bricks slightly wedged-shaped, six inches deep, four inches wide at top, nine inches long, and one inch thick, the rise of the arches being three-quarters to one inch to a foot span, set in Portland cement in the proportion of one part of cement to two parts of sand, the bricks being wetted before use. The weight of the arch was 37 lbs. to the foot superficial, and when levelled up with concrete 70 lbs. Each arch formed the abutment to the other, except at the extremities, where they were tied in with seven-eight iron rods, secured to cast iron springers. Mr. Roberts gives the extra cost of the brick arches at 12s. per cent. on the contract of £7,370, which would be about £1 per tenement, or 5s. per square.

On an experiment as to the strength of these arches, it was found that one of 9 ft. 6 in. span, (calculating the greatest weight that could ever be placed on such a floor, if covered with people, at the rate of 120 lbs. per foot superficial), would bear safely four times the weight, and broke down with six times.

Further particulars as to these arches are given in the "Essay on Dwellings for the Labouring Classes," by Mr. Roberts.

Mr. Bunnett has also patented a system of hollow-brick floors, the bricks joggled at the sides, so that when laid and tied by iron rods, they lock together, each brick being in contact with, and supported by, the six adjoining bricks. This form of flooring has been used at the Grosvenor Hotel and the London and Brighton Railway Station, Pimlico, and can be inspected at Mr. Bunnett's Factory, at New-cross. Specimens and drawings can also be seen at the South Kensington Museum, 46m. and 57z., class Building Materials. Mr. Bunnett gives the cost as follows, ready for the reception of floor-boards and plastering to ceiling :—

Per square of 100 feet superficial.

| | £ | s. | d. |
|---|---|---|---|
| 18 × 13·6 ........................ | 4 | 0 | 4 |
| 16 × 13·0 ........................ | 3 | 18 | 8 |
| 15 × 12·6 ........................ | 3 | 18 | 6 |
| 14 × 10·0 ........................ | 4 | 4 | 8 |
| 12 × 12 0 ........................ | 3 | 8 | 6 |

Mr. Warren has also a system of flooring of hollow brick. Specimens may be seen at the South Kensington Museum, 45m. and 56z. class Building Materials.

Various other methods with brick and tile have been adopted; and for small spans flat tiles in cement, with iron bonds have been successfully employed, and flat arches of tiles are used in Italy and the South of France; but these require thick walls to resist the thrust of the arch. Anything out of the common way, however, is almost sure to be costly, on account of the difficulty of finding men to execute the work, and the care and trouble it gives the builder, who, consequently, charges a high rate, not knowing with certainty what it will cost him to execute.

Among the many systems of the combination of iron joists and concrete, I will commence with that most commonly employed.

### Fox and Barrett's System.

The principle adopted in carrying out this system of flooring, is the substitution of wrought or rolled iron joists for the ordinary timber joists, placed about two feet apart, and filled in between with concrete on wood slips. The surface of the floor can either be furnished with the ordinary boarding, or with cement, tile, slate, stone, or other material; the ceiling can be either finished by plastering to the strips that support the concrete, or by fillets secured to the strips and lath-and-plastered. Any required degree of strength is obtained by increased depth of joists and concrete. This system is well known, having been in use for a number of years at most of the new banks, hospitals, hotels, railway stations, private houses, and many of the model dwellings.

The cost of the rolled iron joists is nearly as follows :—

| | | | £ | s. | d. | |
|---|---|---|---|---|---|---|
| 8 | feet bearing, | about | 2 | 0 | 0 | per square. |
| 10 | „ | „ | 2 | 10 | 0 | „ |
| 12 | „ | „ | 3 | 5 | 0 | „ |
| 14 | „ | „ | 4 | 0 | 0 | „ |
| 16 | „ | „ | 4 | 18 | 0 | „ |
| 18 | „ | „ | 5 | 10 | 0 | „ |
| 20 | „ | „ | 6 | 8 | 0 | „ |

and from £3 to £4 10s. extra can be reckoned for the floor and ceiling, depending upon the kind of finish adopted. Mention having been made of the failure of this system at the Model Dwellings in New-street-mews, Dorset-square, in the report on the Statistics of Dwelling Improvements, on inquiries I find that the surface was finished with Portland cement, which material has, on experience, been shown to be most unreliable for such purpose, but was unfortunately used in many of the earlier buildings constructed on this principle. Asphalte or lead being the only material now recommended for covering the roofs, care must be taken not to have the ceilings plastered before the concrete is thoroughly dry, or else the ceiling will shell off and give to the plastering much the same appearance as if mixed with sea sand. Models of the system can be seen at Mr. Twining's Economic Museum at Twickenham, and at the South Kensington Museum (not numbered). The flooring of the Picture Galleries there is also constructed on this system.

### BEARDMORE'S SYSTEM.

This floor is constructed of vertical plates of sheet iron, with angle-iron rivetted through at the top and bottom. These beams are then placed on the walls, about 2ft. 6in. apart, and plates are rivetted to the bottom angle-irons and the space between filled in with concrete or earthen pipes and concrete. This form of construction was evolved by various experiments made by Mr. Fairbairn and Mr. Hodgkinson (reported in *The Builder*, Vol. vii., page 104), who determined that the uniform presence of concrete against the whole surface of the web and under the top flanges of the beam would produce the effect of a continuous strut, and thus enable comparatively thin plates to assume the true character of a beam or girder. Mr. Beardmore informs me that he never took any steps to prosecute his patent, on account of his professional engagements, consequently I am not aware if it has been employed at any buildings. For large spans it offers great strength: the cost for 14 feet spans would be about £5 per square for the iron, and from £3 to £4 10s. extra for the floor and ceiling. If placed two feet apart, with wood strips, as in Fox and Barrett's system, the cost would be reduced to £3 10s. per square for the iron—the weight of each beam being about 1¼ cwt.

### NASMYTH'S PATENT.

This is similar to Fox and Barrett's, only, in lieu of wood strips, iron plates are bent into the form of a segment of a circle, supported on chord or tension bars, which have the ends bent upwards to retain the plates in their curved position when subjected to pressure.

### CHEYNE'S PATENT

Is also similar to Fox and Barrett's, only, in lieu of wood strips, corrugated iron plates are bolted to the lower flange of the iron joists. Drawings of this patent may be seen at Mr. Twining's Economic Museum, at Twickenham.

### THE FRENCH SYSTEMS.

M. Thuase and M. Creuzot employ rolled iron joists, of a slightly arched shape, placed at a distance of 3ft. 3in. from centre to centre, and connected at intervals of 3ft. 3in. throughout their length by ties of flat bar iron on edge, resting on the lower flange of the girder, and fastened one to another either by wrought-iron straps or cast-iron chairs; upon these ties are placed square bars, three between each pair of girders, running parallel to them from wall to wall, into which their ends are turned down and built in. On the iron frame-work the thick plaster ceiling is formed by a wood platform being placed under, whilst the plaster is thrown from above, the former being removed after the latter has firmly set.

In another method the iron joists are strutted, at intervals of one foot, by square bars, resting on the flange, and having their ends turned up to the height of the web of the girder.

In a third method, the girders are tied together in pairs at 3 feet intervals by round iron bolts, nutted at each end. Small square bars are hung on to these tie-bars, three between each joist.

All these methods can be seen in model at the South Kensington Museum, 24, 25, and 26 J., Building Materials, as well as others by M. Bleuze, M. Zorés, and others, which are fully described in the catalogue, and in the *Builder*, Vol. xii., pp. 29, 95, and 150.

The following are the prices of M. Thuase's system:—

| Bearings. | | | | | Depth of joist. | Depth of floor. | Weight per square. | Price of iron work. | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ft. | in. | | ft. | in. | in. | in. | lbs. | £ | s. | d. |
| 10 | 0 | to | 11 | 6 | 4 | 7⅛ | 370 | 2 | 19 | 5 |
| 11 | 6 | to | 13 | 0 | 4¾ | 7⅞ | 420 | 3 | 18 | 5 |
| 13 | 0 | to | 16 | 6 | 5½ | 8⅝ | 465 | 3 | 14 | 4 |
| 16 | 6 | to | 20 | 0 | 6¼ | 9½ | 510 | 4 | 1 | 9 |
| 20 | 0 | to | 23 | 0 | 7⅛ | 10¼ | 605 | 4 | 17 | 6 |

### THE DENNETT ARCH.

This name is given to a material composed, in part, with either sulphate or carbonate of lime, together with broken calcined cinders, bricks, and other porous material, formed in a soft state, on centering, into arches of spans of from five to ten feet, and in spaces where larger spans are required the width is divided by girders of wrought or cast iron. The abutments against the wall may either be formed with a cant brick slightly projecting, or laid into the walls. The thickness at the crown is from 2½ to 3 inches, with a rise of about ¾ inch to the foot. The arch will either form a floor finished with a polished surface, or it may be left rough, and paved with tiles, or have a boarded floor. The underside of the arch may be coloured, or ceiling joists introduced to form a flat ceiling. The material is stated to have been in use for the last ten years in the Midland Counties with great success, and it has been used in buildings that have settled considerably, without in any way causing a flaw or crack in the arch. The advantages of this material are its cheapness, viz., 60s. to 70s. per square, little or no skilled labour being required, and its extreme thinness (about 3 inches) at the crown, consequently reducing the weight of the walls. Not being able to speak of this material from any experience of my own, I cannot do better than quote from a testimonial by Mr. G. G. Scott, who says:—"I have made use of Messrs. Dennett and Co.'s material for fire-proof arching, and though I have, happily, had no practical experience of its efficiency against fire, I can bear witness to its strength and its extreme convenience of application. I have made use of it in positions in which I should have found it difficult to introduce any other fire-proof material, and it has this advantage, that the arches constructed of it are so entirely in one mass that they cover the space like a compact shell or inverted basin, and are, consequently, almost wholly free from lateral pressure." A specimen of the arch can be seen at the South Kensington Museum (No. 47 M., Building Materials), five feet span, with a rise of 2¼ inches, 4¾ thick at the haunches, and 2½ at the crown. A similar specimen is stated to have carried a weight of five tons without injury.

### MR. WATERLOW'S SYSTEM.

The floors to the landings and passages and the roof in Mr. Waterlow's buildings in Finsbury were composed of clinkers, culm, hard broken coke, and similar rough calcined substances in the proportion of four parts to one part of Portland cement, sufficient water being added to bring the composition to the consistency of ordinary mortar. Bars of three inches by half an inch iron, are stretched edgewise across the building, from front to back, at distances of two feet apart, and carried into the brick-work of the walls and crossed by half-inch iron rods two feet apart, forming a network of iron with a mesh of two feet. A temporary scaffolding is then placed beneath, and the material thrown in to a thickness of four inches; in the course of time the whole mass sets with sufficient hardness to allow of the removal of the scaffolding. Mr. Allen, the builder of the houses, states that the floors can be erected for about £5 per square. This construction is similar to the French system without their girders; and taking into consideration that the iron would hardly carry its own weight, that all depends upon the concrete forming one homogeneous mass, and that should any fracture occur the whole would fall, I do not think it is to be recommended.

COMPARATIVE STATEMENTS OF THE FOREGOING DESCRIPTIONS OF FIREPROOF FLOORS, PER SQUARE OF 100 FEET SUPERFICIAL, FOR A SPAN OF 14 FEET.

| | Thickness of Floors in inches. | Cost. | | |
|---|---|---|---|---|
| | | £ | s. | d. |
| Wood joists, inch boards, and lath and plastered | 11 | 4 | 8 | 6 |
| Same if pugged | — | 5 | 8 | 6 |
| Brick arch, 4½-in. thick iron girder, use of centreing, and levelled up for tiles | 13 & 20 | 4 | 15 | 0 |
| Same if boarded, and the underside levelled, and lath plastered | 24 | 7 | 0 | 0 |
| Hollow brick arches. Cost depends upon the price of bricks, which would have to be made specially. | | | | |
| Fox and Barrett's, with a cement surface | 9 | 5 | 18 | 0 |
| Same if boarded | 11 | 7 | 3 | 0 |
| Beardmore's boarded surface | 11 | 8 | 5 | 0 |
| French systems, about the same as Fox and Barrett's. | | | | |
| Dennett arch | 13 & 3 | 3 | 10 | 0 |
| If tiled | 14 & 4 | 5 | 0 | 0 |
| If boarded, and the undersides levelled and plastered | 15 | 7 | 10 | 0 |

The thickness of the floor ought to be taken into consideration, as it increases or diminishes the height of the building. For instance, a building of five stories with brick arches and boarded floor, would require the building to be 5ft. 5in. higher than another with Fox and Barrett's system, which, in a building of the size of the Streatham-street Model Lodging Houses, would be about 12 rods, or about £144.

## BRITISH ASSOCIATION, BATH, 1864.

### UTILISATION OF SEWAGE.

The following paper, by Dr. Henry Bird, was read in the Chemical Section:—

To utilize the contents of the sewers, and to restore to the land nitrogenous and inorganic principles which are abstracted from it in the growth of crops for the food-supply of man and animals, is one of the most important questions of the day. Some laborious investigations by Parliamentary Committees and Government Commissions have indeed shown that many of the methods hitherto proposed for this object are not sufficiently remunerative to stimulate commercial enterprise in the application of sewage to the soil; but they have at the same time established the fact that an enormous amount of natural wealth is being constantly dissipated, and finally lost to the country. Nor is this extravagance the worst feature of the case; for the continual abstraction of valuable inorganic matters from the soil steadily impoverishes it, rendering it yearly less able to maintain the life and vigour of an increasing population, and gradually, though surely, turning a fertile country into an unproductive desert. Even, therefore, at some temporary sacrifice, to redeem these valuable materials and apply them to their obvious and natural destination would ultimately prove highly advantageous to every district of the kingdom. The benefit of such a measure would not be limited to the production of food. The same works which would secure the utilization of sewage, would protect rivers and watercourses from that defilement and injury which are now progressing *pari passu* with the advance of town drainage and the extension of chemical works, and which, if uncontrolled, must at no distant period destroy all our fresh-water fish, obstruct the channels of rivers by indurated deposits, and render river water wholly unfit for domestic use and human consumption. This too, at a time when, owing to the clearance of forest and wood lands, and agricultural improvements generally, the available supply of water from springs is rapidly diminishing, and becoming quite insufficient in many places for the wants of the people. Not less important is the sanitary aspect of the question. So much information has been obtained and circulated on this subject that it is almost needless to remind this Association that many diseases are called into activity by foul accumulations in drains and ditches, and by the contamination of running water with the excreta of populous districts. Experience has shown that all diseases are aggravated, and especially that epidemics and pestilences extend and become more fatal in communities and families which breathe impure air and drink foul water. Blood poisoning is a common result of poisoned air and water. It is under such circumstances and conditions of atmosphere and water supply, that scarlatina, typhoid, or intestinal fever and cholera break out, spread, and destroy. The subject is, therefore, one of deep interest to all persons concerned in the management of the sick poor; and who is not so concerned? Thus, on sanitary as well as on economical grounds, the right use of sewage is inseparable from the public safety, and essential to the public prosperity. In this matter, however, legislation is indispensable. The most fanatical advocates of voluntary action and personal liberty will hardly venture to assert that the difficulty of the case can be met by individual effort. When this fails, in any such public emergency, the municipal authority, the magistracy, or the national government must act, or the whole population must suffer. Parliament should, therefore, be asked to facilitate the extension of sewage works in the neighbourhood of towns and villages, in order to distribute and apply their excreta to the surrounding land, by irrigation, and by other means; and at the same time to prevent, by stringent enactments, the fouling of rivers and brooks by sewage and other town refuse. The plan now to be submitted to your consideration has never been tried on a large scale, but it has been tested by a limited experiment, and has been found to answer the purpose satisfactorily. It is founded upon the physical properties of sewage, and on a few well-known chemical and mechanical principles. The following series of propositions and axioms embodies these principles and the leading features of my plan. 1. Sewage flowing slowly through pools, or tanks, or confined in vessels separated into three portions, the floating, the precipitated, and the intermediate fluid. 2. The process of precipitation may be produced by the use of cheap, simple, and easily procurable deodorants, to be hereafter specified. 3. Sewage, from the nature of its composition, rapidly undergoes putrefaction, which injures its fertilizing qualities, and causes deleterious and offensive emanations. The same fermentation may be produced by allowing fresh sewage to filter through masses of old sewage in tanks, drains, and more rapidly in large sewers. 4. This process of decomposition may be arrested, and its injurious results prevented by removing the more solid matters of the sewage, and drying them at a low temperature with antiseptic chemicals. 5. In the decomposition of sewage, ammonia and other volatile compounds are evolved, and are soon dissipated and lost. If old sewage be dried by simple exposure, it will be found to possess but a low fertilizing power, but, if dried with sulphuric acid, the ammonia becomes fixed, decomposition is arrested, and the fertilizing principles are retained. 6. The ashes, sweepings, and other refuse of large towns may be rendered available in the fertilization of poor land by percolating fluid sewage through them, for two or three weeks, and drying the mass with sulphuric acid; this compost may with little trouble or expense be made worth at least ten shillings per ton. 7. All manures prepared from sewage should be kept dry and protected from sun, heat, and rain. 8. Fluid sewage, however treated, contains in solution and suspension fertilizing salts and organic matters. The chemical composition of sewage is well known, and its varying quantities and qualities may be easily ascertained from published tables. It is, therefore, unnecessary to dwell upon this point. 9. Fluid sewage can in every case be used for the irrigation of land. It should never be allowed to flow into the sea, rivers, or brooks. 10. The more solid portions of sewage may be easily separated from the fluid by allowing the whole to flow slowly through tanks and culverts, fitted with sluices and tubes, to be constructed upon the plan of models now exhibited—the current being directed through the middle level without disturbing the surface or bottom of the tank. The separation would be accelerated by the use of sulphated clay. 11. Clay, especially the more ferruginous clay and sulphuric acid, mixed in the proportion of one part of the latter with nine parts of the former, in a dry state, forms a cheap and efficient precipitant for sewage; it acts at the same time as a deodorant. It does not in the slightest degree injure the manure, but, in fact, adds materially to its fertilizing quality. 12. In the tanks already mentioned, the floating matter should be daily skimmed off the surface of the fluid sewage, then placed in a reservoir, and treated with diluted sulphuric acid. The precipitated matters should be also removed as often as the divisions or spaces between the sluices and bottom of the tanks become filled, and treated in the same manner with sulphuric acid. These matters so prepared may be dried quickly, at a temperature not exceeding 150 degrees, by spreading the mass upon heated beds of fine ashes or clay, in covered sheds. When sufficiently dried, the compost should be crushed, to make it fit for drilling or spreading on land. 13. When the more solid portions of the sewage are thus intercepted by sluices or traps, and removed (as above directed) offensive emanations are materially lessened if not prevented, and the fluid portion passes tolerably clear out of the tanks. By this method, the fætor caused by the passage of fresh sewage through masses of semi-solid putrefying matter is altogether prevented. It deserves to be repeated—that in order to preserve the supernatant and precipitated portions of sewage the most efficient and economical antiseptic is sulphuric acid; for it fixes the ammonia, converts the vegetable matter into glucose, and checks fermentation; and all the resulting salts are known to be excellent manures for crops of clover, roots, &c. As before said, sewage which has been dried by simple exposure to the air possesses but very low manuring power, the ammonia and its carbonates having escaped. But when dried as above, with sulphuric acid, the nitrogenous principles and the phosphates are retained, unless the temperature be raised so high as to disengage fœtid gases and decompose the sulphate of ammonia. Another method of preparing sewage for agricultural use, after treating it with sulphuric acid, would be to distribute it among a number of cylindrical draining tiles, placed over a bed of coal ashes or clay. These pipes being filled, the fluid filters into the ashes or clay, and water also evaporates from the surface of the pipes. The process should be repeated, until the tiles are filled with solid residuum—which may then be removed for use. The irrigation of land with fluid sewage has been practised successfully and profitably in many places; but it is said to be sometimes attended with offensive smells perceived at some distance. This, as I have explained, is in consequence of an undue amount of the more solid matters being left to decompose upon the surface of the land; and the objection does not hold good when those matters have been separated (as before shown) from the liquid, before it is used for irrigation. But if, without that preliminary measure, the contents of sewers be mixed with ashes or porous earth, and exposed to the weather, the compost increases in temperature, and decomposes rapidly; the heat of the mass drives off the ammonia, and, after it has been washed with rain, it is hardly worth the expense of carriage. Again, the more solid matter of sewage may be readily indurated and dried, by mixing it with common plaster of Paris, a valuable mineral manure, which in no way lessens the fertilising properties of sewage. Indeed, the value of both is increased by combination. It only remains for me to exhibit the action of sulphated clay, both in its dry state and in solution, as also models for tanks, &c., and other means by which percolation through town rubbish may be advantageously effected. A solution of the sulphated ferruginous clay, which may be called "liquid sulphate of alumina, with sesqui-oxide of iron," was sent for analysis to that eminent authority, Professor Taylor, whose report is annexed. When this deodorant is required to purify house-drains and sewers, it should be applied at the very commencement of the drainage system, namely, in the waterclosets, sinks, cesspools (if any), and scullery traps, of every house communicating with the common sewer; half-an-ounce of the liquid, mixed with water, should be used on each occasion, once or twice a day, or more frequently, by means of the simple apparatus, a sketch of which is shown. It would prevent the disengagement of ammonia and sulphuretted hydrogen. It would precipitate the phosphoric acid of the phosphates. If it did not destroy the specific germs of certain infections—as those of scarlatina, or typhoid fever, &c.—it would doubtless check their progress, by removing some of the worse conditions under which they multiply and spread. Once more; land may be irrigated with fluid sewage by sub-soil or underground channels. Drains may be made from nine inches to two feet in depth, either of turf or of drain-pipes, or squares nearly on a level, keeping, however, the outlet of each drain below the inlet. The surface soil would thus be saturated with sewage, without the production of noxious smells, or disturbance of crops, or interference with the cattle-grazing of the land. So much of the sewage as might ascend by capillary attraction through the nine inches of soil to the surface, would be perfectly deodorised, and a powerful manure would be applied directly to the roots of the crops, enriching the soil to a considerable depth. The economy—not to say profit—of these methods of utilising the sewage of towns will be obvious to anyone who will impartially investigate the proposed measures. And I venture to hope that these suggestions may lead to a series of experiments, under the auspices of this Association; experiments which, I doubt not, will convince the most sceptical that the present unjustifiable waste of valuable elements of food ought no longer to be permitted, either by the legislature, or by the local authorities of this kingdom. But, before we conclude, let it be distinctly understood that neither lime, sesqui-oxide of iron, alumina, nor any other deodorant, except sulphuric acid, should be used with sewage when the fluid parts are intended for irrigating land, for those bodies, with that one exception, take some valuable ingredient from the fluid. One part of sulphuric acid to 70,000 parts of sewage would be sufficient to maintain the fertilizing property of fluid sewage, until it had passed into the drains over or into the soil.

APPENDIX.—"Report of analysis of a deodorising liquid.—The liquid is of a pale brown colour, its specific gravity is 1·057, and it leaves on evaporation, 7·5 per cent. of dry mineral residue. Its principal constituents are sulphuric acid, alumina, and oxide of iron; it has a strong acid reaction. The following proportions were obtained by a quantitative analysis, the weights of each ingredient being calculated from an imperial pint of twenty fluid ounces of the solution:—Sulphuric acid (specific gravity 1·78), 454; alumina, 240; sesqui-oxide of iron, 168; total grains, 862. An imperial pint, therefore, contains two ounces (avoirdupois) of the mineral constituents. The admixture of this liquid in proper proportions with sewage, containing sulphide of ammonium, alkaline phosphates and carbonates, would produce a precipitate of alumina and oxide of iron. If sulphide of ammonium abounded, black sulphide of iron and sulphur would in the first instance be precipitated. In reference to the phosphates, the phosphoric acid would also be thrown down with oxide of iron. At the same time the precipitated alumina would tend to purify the liquid by fixing and combining with suspended and dissolved impurities. The mixed deposits of alumina and oxide of iron thus containing the solid ingredients of sewage in an innocuous form, would be in a favourable condition to act as manure. The alkaline bases of the sewage including ammonia, would combine with the sulphuric acid, forming soluble sulphates in the clear liquid separated from the precipitate. The sulphate of ammonia thus produced would act as a good fertiliser of the soil. For the efficient action of this liquid as a deodoriser and precipitant, the sewage should be alkaline, or contain sufficient alkali (as carbonates) to neutralise the acid. A few acres of land arranged in tanks with sluices, &c., for the use of sulphated clay would be sufficient to precipitate the sewage of the largest towns and cities, even the metropolis, and render the fluid sewage clear and nearly inodorous, and still a powerful manure, containing in a gallon from four grains to twenty of sulphate of ammonia, &c.; and the solid matters from the tanks or reservoirs, when slowly dried with one-third their quantity of earth or clay, will be found upon analysis to contain from one to two grains of phosphoric acid with other fertilizing salts and organic remains in every 15 pounds.

Dr. GILBERT said the question was how sewage was to be purified so that it might be sent into the rivers without damaging the water supply of the towns below; and, on the other hand, to what extent could it be rendered available for agricultural purposes. In one district in Edinburgh the fœcal matters from 300 to 350 persons went to an acre, and the amount of fluid sewage averaged from 20,000 to 25,000 tons per annum per acre. The question arose how much might these quantities be reduced with advantage, so as at the same time to get the sewage sufficiently purified to turn into the rivers. At Croydon he had obtained much information. There, about 250 acres were under irrigation. For six months the average showed that the water went two and a half times over the land, and was to a great extent purified. The sewage of Croydon he estimated would contain four grains of ammonia per gallon, including rain-fall, but exclusive of rain-fall six and a half grains. After the sewage had passed over the land it gave only two grains of ammonia, showing a great purification. So perfectly had the water been purified, that, although years ago proceedings had to be taken on account of the pollution of the river, now the people having the fishing were actually putting up grates to prevent the fish from going up the sewage drains. The purification was arrived at by the application of about 6,000 tons per acre, and experience might show that less would do. He thought that about 5,000 tons would be a very useful point to start from in the application of sewage on a large scale. But the great dispute now was, whether we should apply these large quantities to the succulent crops only, or to very large areas, and all crops. He might, in conclusion, read a short paragraph from a report which would shortly be published, as it expressed his views on the application of sewage to meadow lands:—"There is, of course, no question that, if the manurial constituents resulting from the consumption of the corn and meat sent into our towns could be returned to the land from whence they came, its produce would be considerably increased; for, with the mineral constituents there would always be associated nitrogen, in amount which would serve to render effective a considerable portion of all, if not the whole, of some of these constituents. If, however, human excretal matters continue to be diluted with water to the extent recognised by the growing system of urban defecation, and if dilute liquid sewage cannot be distributed in small quantities over large areas at a much lower cost to the farmer than has yet been proposed, there is little hope that the manurial constituents derived from the human food sent into our towns can be re-distributed over the area from which they came. Indeed, having regard to the inapplicability of dilute liquid sewage to arable land, except in small quantities, and in particular seasons, and to the estimated cost of distribution, it appears probable that the most profitable mode of utilisation will be to limit the area by applying the greater part, if not the whole, to permanent or other grasses laid down to take it the year round, trusting mainly to the periodically broken-up rye-grass land and to the application to arable land of the solid manure resulting from the consumption of the sewaged grass, for obtaining other produce than milk and meat by means of sewage."

Mr. TITE, M.P., said the question of sewage was one which had occupied his attention. As a member of the Metropolitan Board of Health the whole matter of the disposition of the London sewage had been before him for a considerable time. The London sewage was something enormous in quantity. It was collected in immense reservoirs, and then poured into the rivers at times when it would be swept out to sea. Thus the whole sewage of London, containing important chemical constituents, was utterly wasted. He had no doubt that they should relieve the basin of the Thames completely of the sewage which fell into it from Chelsea to below London, but, with regard to the utilisation of the sewage they did not see their way clearly, and on another point they were in a great difficulty. This point was, what was to become of the drainage of the large towns above their district, because it was impossible to join them with London, and it was idle to seek to drain Oxford by any lateral drainage that could reach the sea. At the present time Kingston had made arrangements to pour its sewage into the Thames, but was stopped by an injunction obtained by the conservators of the river, by which they had been taught that such nuisances could not be continued. The question then remained, what was to be done with it? Two facts had been proved. At Leicester, where the experiments had been carried on regardless of expense, it was proved that deodorising of sewage by lime would purify water, and prevent it becoming a nuisance to the stream. Since then it had been proved that fish flourished there, and the herbage and fruit, which before were poisoned, had now returned to their normal condition. This fact was also apparent, that the products which it had been thought would be sufficient to pay for these works had proved an entire failure; and, except for the lime used, which was very useful for the fertilisation of land, they had proved utterly useless. The other fact was the experiment at Croydon, which certainly did appear most successful. There the river formerly was polluted by the sewage. A farm of forty acres was then taken; ordinary drains were cut, the sewage was turned into the land before it passed into the river, thus purifying it of its offensive ingredients, and proving of great advantage to the land. Croydon had thus solved the problem extremely well; but how such a system could be applied to London was a problem still unsolved.

The Dean of YORK said he understood that in the Case of Croydon the sewage water was sent into the river in a comparatively pure state, so pure, indeed, that fish could live in it. He also understood that the sewage water there, though not exactly pure, was so to a great extent. Had any chemist made experiments as to what effect the drinking of such comparatively pure water would have on animal life?

Mr. TITE, M.P., believed that such experiments had not been made.

Professor WILLIAMSON drew attention to the fact that when cholera prevailed lately in this country its origin was believed to be traced, in many instances, to the fact that the sewage drained into the pump wells.

Professor BENNETT, of Edinburgh, observed that much importance had been attached to the question of deodorisation, and smells were regarded not only as a nuisance but were supposed to be a cause of disease. He believed that the effect of smells as a cause of disease had been much exaggerated, and he instanced Montfaucon, near Paris, in proof of this. The sewage of Paris was taken to Montfaucon, was there allowed to dry in open pits, and it was found not to interfere with the health of the district, though the smell was certainly terrific. In Cologne and in Belgium, the sewage was utilised in a similar manner. The dried deposit of the sewage was reduced to powder, and as poudrette was conveyed to the land, where it proved a most valuable manure.

Mr. Tite, M.P., wished that the meeting should not be misled by the last speaker. In Paris, cesspools were still permitted; in London they had long ago been denounced as the great cause of fevers, and were no longer allowed.

Dr. Lloyd opposed the views expressed by Professor Bennett. It had been proved that the smell of sewage was noxious, and in the district near the river in Bath he had long noticed that amongst those who resided there, first came degradation, then ill-health, and then premature death.

Captain Galton said he knew numerous instances of disease from the state of the river Thames.

Mr. Rumney, of Manchester, said cesspools, as in Paris, were permitted in Manchester, and there was no evidence that fever or other diseases prevailed there to a greater extent than in other towns in the kingdom.

Mr. Thos. Webster confirmed the statement made by Mr. Rumney.

## BRITISH PHARMACEUTICAL CONFERENCE.

At a recent meeting held at Bath, Mr. H. Deane, F.L.S., President, in the chair, the Report of the Committee on "Accidental Poisoning" was read by Mr. J. Raymond King.

After referring to the great interest which the subject of accidental poisoning had excited in the minds of members, the desirability of a thorough investigation of the question, with the object of preventing the recurrence of accidents, and the difficulties which beset the question, the report went on to state the course of proceeding adopted by the Committee in order to make the discussion of the subject interesting and practical. The Committee thought it advisable that their deductions and remarks should be based upon the results of statistical inquiry. They carefully examined the cases of accidental poisoning, as reported in the *Pharmaceutical Journal*, from July 1862 to June, 1864, inclusive. These are 25 in number, and may be thus summarised:—Ten cases in which the mistake was committed by the administrator; two by a surgeon, one by a wholesale house, one by a grocer's wife, and eleven by retail chemists or their assistants. The cases were elaborately detailed in the report; and after a careful examination of the merits of each, and an intimation that the Committee had corresponded with many gentlemen likely to form an opinion on the subject, the Committee came to the following conclusions:—

1. That there are seventeen out of the twenty-five cases in which there is every reason to believe that a thoroughly-effective poison-bottle would have prevented the accident.
2. That there are at least three cases in which, had the poison sold been folded in black paper, and labelled properly, the accident would not have occurred.
3. That 80 per cent. of the usual cases of accidental poisoning may be prevented by the use of proper precautions.
4. That only one of the 25 cases was the direct result of ignorance.

The practical suggestions and recommendations made by the committee may be thus summarised:—

1. That to all persons engaged in the practice of pharmacy, the facilities which exist for acquiring a theoretical as well as a practical knowledge of their business, render it incumbent upon them to do all in their power to make themselves thoroughly acquainted with their profession, in order to future safety and usefulness.
2. That a separate and suitable part of their shops or premises, be set apart for dispensing prescriptions wherever this has not already been done.
3. That in the dispensing department there be a repositorium toxicorum, or poison cupboard, with lock and key, in which should be kept all the concentrated and virulent poisons; or a small bottle of each, sufficient for present use, the bottles being filled from store bottles, which should be kept in another and larger store cupboard or room, as required.
4. That the labels upon all shop and store bottles be in future so placed that the whole of the label can be seen at a glance, on the plan introduced by Messrs. Ford and Shapland, of London, instead of writing round the bottles, as at present arranged.
5. That, wherever practicable, every prescription be checked by a second person before it is sent out.
6. That liniments, lotions, and all poisonous liquids be dispensed in bottles registered by Mr. Merrikin, of Bath, and called "Merrikin's Caution Bottles," as being in the opinion of the committee superior to any other bottles hitherto used for the purpose, and that the labels be printed in red ink.
7. That the more concentrated and potent poisons, such as strychnine, morphia, prussic acid, &c., should not be sold in an unmixed state, without a medical order, under any circumstances whatever.
8. That no poison be sold in a dangerous quantity by any assistant or apprentice without the express sanction of the principal.
9. That every poison, in addition to its name, be distinctly marked "Poison" before it is sent out, excepting medicine dispensed from a prescription where the statement of the dose or use of it may be considered sufficient.
10. That dry poisons, such as oxalic acid, sugar of lead, red and white precipitate, &c., be invariably folded in *black* paper, and in addition to the name of the article, that a label with the word "Poison" in bold white letters on a black ground be securely attached to each packet.

## Fine Arts.

South Kensington Museum.—In accordance with the usual practice of the Museum in receiving valuable works on loan, a collection of choice oil paintings of the Dutch school, 56 in number, has been lent for exhibition by John Walter, Esq., M.P., and is now arranged on the walls of the gallery from which the Mulready pictures were lately removed. The collection consists of works by Berchem, Both, De Hooge, Du Jardin, Gonzales Coques, Hobbema, Maas, A. Ostade, T. Ostade, Paul Potter, Ruysdael, Van Stry, Weenix, and other celebrated masters.

Public Encouragement of Art.—Thirty-eight artists have received commissions in connection with the decoration of the new Church of the Trinity in Paris, the total amount to be expended in ornamentation being about £9,200.

M. Menissier, a distinguished painter, lost his life the other day by falling from a scaffold in the Church of Saules, where he was engaged in an important work.

M. Paul Balze is about to execute, in the porch of the new church, Saint-Augustin, in Paris, three pictures of Faith, Hope, and Charity, in what is called *peintures émaillées sur lave*, a new process said to be admirably adapted for decorative works.

**Public Statues** are about being erected at Laveur, to Count Las Cases; in Dauphiny, to the Chevalier Bayard; in Normandy, to Richard Lenoir, the famous self-made manufacturer; at Cognac, to François I.; in Corsica, to the Duc de Padoue; at Florence, to Dante; at Pesaro, to Rossini; and at Maeseyck, in Belgium, to the brothers Van Eyck. This last has been inaugurated with great ceremony, the whole of the royal family being present, and the sculptor, Leopold Wiener, being decorated by his Majesty with the Cross of Leopold.

**Notre Dame.**—The upper portion of the front of the north transept of this church has just been completed, and the magnificent rose window, entirely restored, is uncovered. This window is about forty-two feet in diameter, and its details are extremely graceful.

**Statue Discovered at Rome.**—There is much talk about the discovery of a colossal statue, in bronze gilt, at the depth of fifteen feet, in the Court of the Palace of Prince Pio, in the Place du Biscione, at Rome. On this spot stood originally the theatre named after Pompey, the first building of the kind in Rome built of stone. The palace had recently been purchased by M. Righetti, who, in order to enlarge it, caused some excavations to be made, when the workmen first found a thumb, and afterwards a very fine arm, evidently detached from a statue which must have measured twelve feet in height.

**Annual Competition for Prizes, Paris.**—The exhibition of the works of the pupils of the Paris School of Art competing for the grand prize of Rome has just taken place, with the remarkable exception of paintings. The omission of the last arose out of an unfortunate accident, under the new system: the awards were to be given by juries elected for the occasion, and not by the Academy, and in order to shut out all chances of canvassing, the members of the jury were appointed at the latest moment, but many of them were absent from Paris, and the consequence was that only two or three attended, and the adjudication of the prize in painting stands, in consequence, adjourned *sine die*. The subject for the competition in sculpture was, "Ulysses Bending the Bow;" and two of the models sent in are very clever works, but neither sufficiently remarkable to warrant the prize, which has therefore been divided between the two young sculptors, Delaplanche and Deschamps. The subject given to the architectural pupils was, "An Hospice on the Alps," and the results are a number of most elaborate drawings, some of them exhibiting much talent, but not one of them more valuable for architectural purposes than a theatrical scene of the great Saint-Bernard. In this case M. Guadet obtained the prize, with the acquiescence of the public, but no exhibition ever illustrated more fully the objection made by M. Viollet-le-Duc and other reformers to competitions in which the pupils are fixed to a given subject, and that subject a fantasy. The failure of the painting committee under the new system is a triumph for the academical party, but the exhibition adds another blow to the existing mode of education which fixes all the conditions beforehand, and ties intuitive genius or talent hand and foot. The world of art has had far too many "Ulysses bending his bow," and "Belshazzar" palaces perched on inaccessible mountains; it wants to see the individual capacities of artists evolved, for fear all architecture should resolve itself either into copies of this or that temple, on the one hand, or into the railway style on the other. The specimens of engraving were considered unworthy of the grand prize; the result is the failure of two out of three competitions, and the adjournment of the fourth.

## Manufactures.

**Butter.**—The *Grocer* says:—At present, in many parts of England, much inconvenience is experienced from the scarcity of fresh butter. The profits on this article have of late years been greatly diminished, and substitutes have been much spoken of. It is worthy of remark that the districts most famous for butter supply the meanest quality of cheese. We hear much of Leicester cheese, but we are not aware that that county excels others in its butter supply. A vegetable butter, superior in richness to that produced from cow's milk, is obtained from the shea-tree, in Africa; and at home here the consumption of marmalade is greatly on the increase as a substitute. The average price of English butter, taking a series of years over a wide area in this country, is 1s. per pound; the present price, in most of our provincial markets, is 1s. 6d. per pound; but it has reached 2s. at Stamford. It appears from our last week's market news that at Carmarthen, notwithstanding the short supply, butter sold at 1s. 0½d. The scarcity has been felt in Ireland, but supplies are now increasing. Messrs. Lalor and Sons, of Dublin, in their last circular, report the weather as highly favourable for pastures, and large supplies with but a limited demand, at a decline of fully 1d. per pound on cools, and 4s. to 6s. per cwt. on firkins, and the market closing without any symptoms of recovery. The delivery from the sister kingdom last week was only 2,669, against 8,800 firkins in the corresponding week of last year. The imports, however, of foreign butter for the same week show a very large increase—20,052 against 12,521 firkins in 1863. By economy, and the introduction of substitutes, we may reasonably hope that the price of this useful article of diet will in course of time be lowered, though we fear it will never again compare with those of past years.

**A Smoke-consuming Furnace.**—There has for some time past been in operation at the engineering works of Messrs. Moreland, 3, Old-street, City, a furnace, invented by Mr. E. B. Wilson, which is said to economise fuel to a considerable extent, and to be almost smokeless. It consists of, at the back, a chamber or box to contain the fuel, and a reverberating oven connected therewith, the flue being at the other end of the oven, and connected with the ordinary chimney-stack. The coals are ignited in the box, to which they are supplied periodically—about two or three times a day. As there are no fire-bars in the furnace, the air enters upon the surface of the fresh coal in the box, causing a downward draft, as the floor of the reverberating oven slants downwards from the coal box. The gas is thus slowly and continuously distilled until it comes in contact with the lower strata of burning coals, when it receives its proper dose of caloric, and passes into the reverberating oven, heating any material that may be placed there, and passes away downwards by the flue which descends at a point a little inwards from the mouth of the oven. In the ordinary method of feeding a furnace with fresh coal, it is thrown on the top of that which is already ignited, and of course a large quantity is thrown off in smoke and is lost, thereby greatly impairing the heating quality of the furnace, as well as poisoning the atmosphere. In this furnace the gas, which is formed by the contact of the unconsumed coal, passes through the heated spaces, and is itself heated to the required temperature; it then passes through the reverberating oven, and heats there any material exposed to it, and the furnace may be so managed that scarcely any of this gas shall pass off in smoke, but will be nearly all consumed. Looking towards the front of the furnace, that is, the place at which the iron or other matters to be heated are inserted, the flames are observed coming towards—not, as in ordinary furnaces, flowing backwards from the spectator. In fact, the principle here adopted is simply that of turning a fire upside down, or a furnace back foremost, so that the fresh coal is applied at that end whence the smoke of its first ignition goes through the fire and is consumed, instead of being placed on the end of the fire, whence the direction of the draft carries it off as soon as evolved.

**A New Gas Engine**, or *gazomoteur*, the invention of M. Belon, has been introduced at the paper factory of M.

Anzin, near Paris, and has been favourably reported upon by the Academy of Sciences. It is stated that the machine possesses an economy equal to 60 or 70 per cent. It consists of three principal parts—an air-pump, a smoke-consuming furnace, and a motive cylinder. The furnace, when the engine is at work, remains closed, unless at the orifice by which the air-pump opens on it, and the one by which the heated air sets the cylinder in motion. It is so arranged that a quantity of combustible matter, equal to that which it consumes, falls constantly into it. A state of combustion is kept up by the air-pump. Part of the air passing from this rushes into the furnace, the rest combines with the coal-gas, forming thus a gaseous mixture, the volume of which is far greater than that of the air previous to its introduction to the furnace. This mixed air acts on the piston of the *cylindre moteur* with a force proportionate to the increased volume produced by the elevation of the temperature.

## Commerce.

Paper Exports.—The quantity of paper for writing and printing purposes exported in the first seven months of this year was 65,586 cwt., against 62,822 cwt. in the corresponding period of 1863, and 49,383 cwt. in the corresponding period of 1862. The total exports to July 31 may be thus set down:—British India, 16,760 cwt., against 15,493 cwt. in 1863; Australia, 32,883 cwt., against 29,702 cwt. in 1863; and other countries, 15,943 cwt., against 17,627 cwt. in 1863. The exports of paper of other kinds (except hangings) amounted, to July 31, to 28,043 cwt., against 25,620 cwt. in the corresponding period of 1863, and 31,114 cwt. in the corresponding period of 1862. These latter exports were made up thus:—To British India, 1,826 cwt.; Australia, 14,772 cwt.; and other countries. 11,445 cwt. The total exports of paper of all kinds to July 31 this year were thus:—93,629 cwt., against 88,442 cwt. in the corresponding period of 1863, and 80,497 cwt. in the corresponding period of 1862. The value of the paper for writing and printing purposes exported to July 31 this year was £237,021, against £227,558 in the corresponding period of 1863, and £186,420 in the corresponding period of 1862. The value of the paper of other kinds (except hangings) exported to July 31 this year was £66,500, against £63,328 in the corresponding period of 1863, and £63,885 in the corresponding period of 1862. The aggregate value of the paper of all kinds exported to July 31 this year was therefore £303,521, against £298,886 in the corresponding period of 1863, and £250,305 in the corresponding period of 1862. Paper of all kinds was imported, to June 30 this year, to the value of £214,730, against £180,089 to the corresponding date of 1863, and £182,472 to the corresponding date of 1862. To these totals paper for writing and printing purposes contributed £165,005 this year, against £144,563, and £131,492 respectively.—The value of the imports of materials used in making paper amounted in the first five months of this year to £226,584, against £122,981 in the corresponding period of 1863, and £89,601 in the corresponding period of 1862.

Tea Cultivation in India.—A Calcutta paper states that the tea-planters in Assam and Cachar complain bitterly of the want of efficient control over their native labourers. There is little or no local labour in the tea districts, and workmen (or coolies) have to be brought from other parts, at a very great expense, under engagements to serve for a certain space of time. These engagements or contracts are frequently broken by the coolies, who desert the planter who engaged them, to go where they can get rather higher wages. The only present remedy lies in an action of civil law, which cannot be decided under such a lapse of time that crops may have been spoilt for want of labour; and if the case result in the planter's favour, the decision is of no use to him, as it only enables him to obtain damages from the coolie. Imprisonment is generally the alternative, as the debtor in most cases has no means of payment, and additional injury is thus entailed on the planter by prolonged loss of the time of his workman. The contempt of contracts in India some years ago ruined the trade in Indigo, and those who understand the country urge the necessity of severer measures, so that prompt punishment by criminal process might result from direct breach of faith. It is hoped that the Indian Government may be induced to pass a law sufficiently stringent to deal with this important subject, which otherwise threatens to bring ruin on many enterprising tea-planters.

Beetroot Crops in France.—A letter from Lille says that two months ago, from the extent of the cultivation and from the appearance of the beetroot, a crop of 200,000 tons was reckoned on; but the drought, which lasted till the 22nd of August, did great harm; and the tardy rains have only partially remedied the evil. Only 140,000 to 150,000 tons are now expected to be made, in either case about 40,000 tons more, and not less, than last year. The figures given below show the importance of the beetroot sugar industry in France during the last twelve years. The season lasts from the 1st September in one year to the 31st August in the next. The quantities are given in million kilogrammes:—

| Seasons. | Mil. kilos. | Seasons. | Mil. kilos. | Seasons. | Mil. kilos. |
|---|---|---|---|---|---|
| 1852–53 | ... 75 | 1857–58 | ... 151 | 1862–63 | ... 174 |
| 1853–54 | ... 77 | 1858–59 | ... 133 | | |
| 1854–55 | ... 45 | 1859–60 | ... 126 | 1863–64 | ... 108 |
| 1855–56 | ... 92 | 1860–61 | ... 101 | | |
| 1856–57 | ... 83 | 1861–62 | ... 146 | 1864–65 | ... — |

Since 1864 the use of beetroot has been divided between the production of sugar and distilling; at present about two-thirds is used for sugar and one-third for distilling, that is to say, that if the crop had been good, and if it could all have been used to make sugar, there would have been produced this season 300,000 tons of sugar in France.

The Wool Trade.—In the public sales of East India wool, recently held at Liverpool, about 17,000 bales were brought forward. The opening prices showed an average decline of 2½d. per lb. on July rates, which soon increased to 5d. and 3½d. per lb. There was, however, throughout a good competition at the decline. The advanced rate of discount, the unsettled state of public opinion as regards the duration of the war in America, and the heavy decline in the value of cotton, have all had their influence in bringing about the fall in the wool market.

## Colonies.

New Zealand.—The gross customs receipts, exclusive of gold duty, for the year ending 31st March last, amounted to £25,752 7s., of which the provincial treasurer has received £11,278 14s. 11d., being £1,278 14s. 11d. in excess of the estimate; and in addition to this the sum of £1,627 10s. 5d. has been received from the General Government as surplus revenue. The gold duty for the same period amounted to £1,028 2s. 2d. The land fund was estimated at £30,000, which, as about the average of nine years' previous receipts, might be supposed to be a reasonable conjecture. The amount actually received was, however, little more than half this estimate, being £15,127 net, and showed a sterling decrease of £44,267, or nearly seventy-five per cent. upon the receipts of the previous years—£59,394. The failure of the wheat crops this season over so large a portion of Australia—however ruinous it cannot but prove to many—will at least have the advantage of showing the farmers that it is dangerous to trust to one crop alone for the year's production of their farms. The attention of farmers should certainly be called to a promising crop, and one which has never yet been tried in the colony—it is flax. One great advantage of a flax crop is the short time it occupies the ground—the proper time for sowing being the end of August, and it would be ready for pulling about Christmas. The length of time it remains in the ground depends much on whether the principal object of the grower is to obtain a fine and high-priced fibre, for which purpose it must be pulled before the seed is ripe, or whether he will be content with a fibre not quite so fine, but accompanied with the ripe and merchantable seed. In the one case the flax may be gathered two or three weeks sooner than the other. As a rotation crop flax is very valuable. It will thrive well after wheat and oats, and will require no manure. The only necessary condition is that the ground be well worked and friable at the time of sowing. It is an excellent crop with which to sow grass and clover. No doubt the present price of flax may be regarded as exceptionally high, owing to the price of cotton, consequent on the American war. Still it is by no means an unreasonable surmise that by the increased production of flax, and by the improvements in the machinery for preparing and manufacturing it, the civilised world might yet return to linen goods.

Productions of Otago.—A local paper reports that a discovery of quicksilver had been made at Hamilton's diggings there. Dr. Hector, the provincial geologist, reports that the mineral is in the form of cinnabar, which usually contains 86·2 per cent. of mercury and 13·8 of sulphur. The specimens submitted to him were tolerably pure. He adds that the discovery is valuable if the mineral exists in any quantity. The reduction of the ore is a simple process, not requiring much capital. It appears that the finances of the Otago Government are by no means in a flourishing condition. The treasurer, in a speech on the subject in the Provincial Council, said he had £70,000 to pay in the course of June, and only £30,000 to do it with, while the bank had absolutely declined to allow the overdraft to be increased. In this state of matters authority was given to the Ministry to sell unsurveyed as well as surveyed lands, a course which a portion of the press warmly opposed. The same journal states that a single escort recently brought to Dunedin no less than 13,108 ounces of gold, of which 4,285¾ ounces were from Queenstown, 2,116 ounces from Hamilton, and 1,872 ounces from Tuapeka.

Agriculture in California.—When it is remembered that but little more than a decade of years has elapsed since California was mainly dependent upon the Atlantic States and Chile for her breadstuffs, the subsequent advance made by that prolific state in the culture of cereals, as fully set forth by statistics in the San Francisco *Price Current*, is truly remarkable. Not only is she come to be self-sustaining in this particular, but her exports of flour and cereals to foreign countries far exceed the expectations even of enthusiasts. The following are the exports of wheat and flour from San Francisco to different countries for the fiscal year ending June 30th, 1864:—

| | Wheat. | Flour. | Equal to brls. Flour. |
|---|---|---|---|
| | Sacks. | Barrels. | |
| To England | 813,553 | 2,507 | 273,691 |
| China | 161,574 | 53,246 | 107,104 |
| Japan | 84 | 1,236 | 1,264 |
| Australia | 90,890 | 63,337 | 93,634 |
| Victoria, V. I. | 3,809 | 26,914 | 28,184 |
| Hawaiian Islands | 121 | 4,699 | 4,739 |
| Mexico | 15 | 11,943 | 11,948 |
| Peru | 260 | — | 87 |
| New York and Boston | — | 9 | 9 |
| Other countries | 986 | 20,211 | 20.539 |
| Total | 1,071,292 | 184,102 | 541,199 |

The opening of an export trade in agricultural products to China and Australia, to say nothing of other countries, promises important results to California. The trade has already attained large proportions, and bids fair to steadily increase. Had it not been for the high prices in San Francisco during last spring and early part of the summer, consequent upon the drought, and an apprehended scarcity for home consumption, the exports to Australia, Victoria, and China, would, it is stated, have been large; but the sudden rise in prices rendered it impracticable to execute many of the orders received, for the transportation of which vessels ballasted with coals were specially sent from England. At the latest dates the export movement was at a stand, and the *Price Current* states that parties there had ordered by telegraph shipments of flour and wheat from this port to China direct. The exports of barley and oats from California for the year ending June 30th were as follows:—

| | Barley. | Oats. |
|---|---|---|
| | Sacks. | Sacks. |
| To Victoria | 20,545 | 4,698 |
| New York | 841 | — |
| Australia | 8,082 | 80,849 |
| China | 200 | 4,133 |
| Mexico | 556 | 96 |
| Hawaiian Islands | 10 | 976 |
| Japan | — | 313 |
| Other countries | 36 | 25 |
| Total | 40,270 | 91,403 |

With regard to the surplus stocks in California, it is stated that flour had been sold up close to the production, while a handsome surplus of wheat was in the hands of the farmers, and held at about 3c. per lb. Barley was very low in stock, though there was said to be sufficient to supply the demand for brewing purposes. Last year's crop of oats was proportionately greater than any preceding year, and the surplus remaining is admitted to be very large. The *Price Current*, after a full view of the case, arrives at the conclusion that all grain crops for the current year will be quite ample for home use, notwithstanding the drought. From a comprehensive survey of the whole grain-growing districts of California, and a careful comparison of views with those best informed, by letter and otherwise, it feels warranted in estimating the wheat crop of that State for 1864 at 2,000,000 sacks of 100 lbs. each, or just one-half the estimated crop of 1862, which at 1 dol. 65c. per 100 lbs., yielded an aggregate of 6,000,000 dols.

Coal in Australia.—The official examiner of coal fields in the Illawarra district, to the South of Sydney, states that the southern coal is of a different character to the northern coal, yet the two have always been suspected to be of the same general formation. It has been often guessed that the northern coal-field dipped under Sydney, and reappeared at Wollongong. By a careful examination along the coast of the superimposed strata, the connection of the two coal-fields seems to have been established. The Wollongong coal seam, it appears, is not identical with any of those worked at Newcastle, but is a more elevated seam. If it ever existed at Newcastle, it has suffered denudation, and has disappeared. The lay of the Wollongong coal measures is traceable with tolerable clearness along the face of the sea cliff. The top seam vanishes below the water line, at a point about thirty-four miles south of Sydney. It has been identified as reappearing above the water at Tuggerah Beach to the north of Sydney, and about seven miles south of Lake Macquarie. The Tuggerah Beach coal (which has not been worked) lies next above the Lake Macquarie coal, and its identification with the Wollongong coal enables the section of the coal basin to be so far completed that the order of superposition between the Southern and Northern measures is determined. Two other outlying coal measures are known to exist, one at Mittagong, further south than Wollongong, and one above Stroud, north of Newcastle. There are said to be twenty-six different seams of coal, averaging three feet in thickness, or containing altogether 157 feet in thickness of coal. The strata in which these seams are imbedded represents a depth of five thousand feet. These twenty-six seams do not form an exhaustive list of coal measures, but include only those which have been so far examined as to be placed in their order. The collocation of other known seams awaits further investigation.

## Forthcoming Publications.

Shipbuilding, Theoretical and Practical. By Isaac Watts, Esq., C.B., W. J. M. Rankine, Esq., C.E., LL.D., F.R.S., Frederick K. Barnes, Esq., James Robert Napier, Esq., with contributions by eminent practical shipbuilders. Corresponding and general editor, W. J. Macquorn Rankine, C.E., LL.D., &c. (*William Mackenzie*).—This treatise will provide a complete system of information on the Art of Shipbuilding, and on the scientific principles on which it is founded. There is a growing interest felt in the education of British Naval Architects, and a strong desire that it should not fall short of what is now being accomplished in France. Hence one object of the work will be, to lay down the scientific principles of Naval Architecture in as plain and clear a manner as possible, for the benefit more especially of young students who may desire to be well grounded, in order that they may afterwards advance without hesitation in the prosecution of their honourable and useful profession. The work will extend to 400 pages, illustrated by extensive tables, more than 100 woodcuts, and by upwards of 30 large plates of ships and engines, taken from models whose excellence has been proved by their practical success. The following is a summary of the contents of the treatise:—1. *Hydraulics of Shipbuilding; or Buoyancy, Stability, Speed, and Design.*—This part explains the scientific principles which guide the Naval Architect in designing a ship, so that she shall possess the properties required of her, as to displacement, steadiness, and speed, in order that she may fulfil her practical object; and in computing the power which will be required to drive her at her intended speed, whether by sails or steam. 2. *Geometry of Shipbuilding; or Modelling, Drawing, and Laying-off.*—This part describes the methods by which the model and plans of an intended ship are constructed, and the figure and dimensions of her parts laid off. 3. *Strength of Materials as applied to Shipbuilding.*—This part sets forth the facts and principles known as to the strength of the materials of which ships are built, whether timber or iron, and the application of those facts and principles to practice. 4. *Practical Shipbuilding.*—This part describes the processes gone through in shaping and putting together the materials treated of in the preceding part, during the actual building of ships, together with their whole structure and fittings. 5. *Masts, Sails, and Rigging.*—This part treats of the principles of the propulsion of a ship by sails, and the structure of the parts which effect that propulsion. 6. *Marine Steam Engineering.*—This part sets forth the scientific principles of the propulsion of a ship by steam-power, and the practical rules which regulate the construction and working of her engines. 7. *Shipbuilding for Purposes of War.*—This part explains the principles and practice of the art of building and fortifying vessels of war of different kinds, and will be illustrated by plates of H.M.S. *Warrior*, engraved from copies of official drawings authorized by the Lords Commissioners of the Admiralty to be made for this work.

## Notes.

Labourers' Cottages.—Mr. Disraeli, M.P., in a recent speech before the Buckinghamshire Agricultural Association, said:—"I consider it of the utmost importance that agricultural labourers should be well housed. In my opinion it is more important than a question of food or raiment. I believe we all eat quite enough, and many of us drink a great deal too much—but this I will venture to say, that no man can be too well housed. A perfect sanitary condition as regards habitations is one which, whilst it preserves and defends the inhabitant from the inclemency of the seasons, allows him to breathe and enjoy pure and unvitiated air. For these reasons it is the truest source of health and wealth. There are great difficulties in the way, and the first difficulty is that it is an investment for capital which does not bring *us directly* an adequate return. This is an objection which I consider fallacious. The point is what do you consider an adequate return? Ask the farmer whether he would like to have on his farm his labourers in healthy habitations, or living two or three miles from the acres which he cultivates, in miserable hovels which engender sickness and weaken their energy and strength. The farmer will say directly, 'Give me labourers who reside on my acres and who reside in houses which allow them to come to their labour full of energy and vigour—energy and vigour given by sound sleep and pure air.' The farm will then be more valuable to the tenant, and if so it must be in the long run more valuable to the proprietor, and this does tell upon the rent. In this way the landowner will find an adequate return for his investment. I do not say that this is an easy difficulty to combat. It is a great one, but it must be met. The question, however, is usually argued as if the proprietor was called upon suddenly to sweep away all the miserable tenements that he has inherited, and to cover his estate with model cottages. That is impossible, for you cannot in one instant effect this great change. You cannot unhouse the whole peasantry of an estate at once; it can only be done gradually. Take a model estate of 2,000 acres. On that estate you require a minimum of sixty cottages. The expenditure for erecting sixty cottages would probably be £6,000 or £7,000. I have seen the estimate for such an expenditure. Well, how is a man to expend £6,000 or £7,000, which is perhaps three times his rental, unless he has, which we have no right to suppose, other sources of capital? No one expects, because we have discovered a want in our social system, and a duty to perform, that it is to be done in a manner injurious to ourselves. You cannot expect every landed proprietor to be a Duke of Northumberland—a man whose mind is as extensive as his fortune, and who built cottages on 200,000 acres at an expense of some £500,000. Her Majesty conferred a ribbon on the Duke of Northumberland because he created a Channel fleet at the moment we had none; but the man who lays out £500,000 in building cottages on his estate as much deserves a blue ribbon as the man who creates a Channel fleet, or even at the head of a Channel fleet leads us on to victory. Every man cannot do what the Duke of Northumberland has done; but every man can do something. He may build a few cottages or repair others. You ought to keep before your eye clearly and closely the object you have to attain, and avail yourselves of every opportunity of accomplishing the result. The other day I saw some inferior tenements built by persons who speculate in building cottages. These inferior tenements were purchased and converted into excellent cottages—not exactly model cottages, but cottages in which a man may live in health and in some degree of comfort and happiness. These are opportunities which every man may avail himself of. This is a duty which must be performed. The question is becoming both in town and country one of paramount interest."

The Alhambra.—An extraordinary rumour is current in Paris that this celebrated palace of the Moorish Kings of Spain is for sale. It is well known as the finest specimen of its class, and as one of the most remarkable buildings of the middle ages; and it has a great historical interest, not only in relation to its founders and original occupants, but to Charles Quint, Philippe V., and the Abencerages.

LADIES' SANITARY ASSOCIATION.—In the seventh annual report of this Association, just published, the committee congratulate the members on the increasing interest manifested in their work. During the past year the committee have issued upwards of 90,000 tracts, making a total of upwards of 703,000 published since the establishment of the Association. Clergymen and medical men constantly make application for grants of tracts for distribution among the poor. Upwards of fifty ladies have attended the college classes for chemistry, physiology, and public health, under the teaching of Dr. Wood and Dr. Richardson. The gymnastic classes have been conducted at the Home and Colonial Training Institution, the British and Foreign Training School, and the St. John's Servants' Home. Upwards of 12,800 poor children, inhabiting the worst parts of the metropolis, were sent out into the parks last summer under the charge of proper guides, the expenses being defrayed from the special fund for park parties. One of the most important of the operations of the Association during the past year was the establishment of the "London Dressmaking Company," the aim of which is to establish a dressmaking business for the furtherance of the following objects:—1st. To frame a model establishment which shall, by its example, teach others how business may be carried on without detriment to the minds and bodies of the workers. 2ndly. To induce ladies to pay their bills regularly, and to give their orders in good time. 3rdly. To provide a fund to be used according to the discretion of the directors, for the benefit of those employed in dressmaking. Several gentlemen have delivered gratuitously lectures to the working classes in various parts of the metropolis. Arrangements have been made for the delivery of a course of lectures on Domestic Economy and the Laws of Health at Mechanics' Institutions, Working Men's Clubs, Youths' Institutes, and kindred societies; and in May 1865, Examinations will be held by the Metropolitan Association for Promoting the Education of Adults in these subjects.

## Correspondence.

FRESH EGGS.—SIR,—I see in your *Journal* of this date a notice of how eggs may be preserved fresh by being rubbed with a solution of beeswax and oil, so as to exclude the atmospheric air. *Apropos* of this suggestion, I would beg to observe that a Scotch farmer recently paid me a visit, and brought with him a peace-offering of seven dozen fresh eggs. These eggs had been all rubbed with salt butter as daily collected—according to an old but neglected plan. And having now, with the assistance of my children, got, alas! very near to the end of the aforesaid seven dozen, I have to testify that every egg was not only perfectly fresh, but as curdy as if it had been laid a few hours before it was eaten; and my friend informs me that eggs so treated with salt butter will remain fresh for months. Eggs of the above quality are sold to the Edinburgh shops at elevenpence the dozen, and if so, may one not ask why we Londoners are obliged to pay threepence each for not curdy—but for so-called, "new-laid?"—
Yours, &c., GEORGE WYLD, M.D.
September 23, 1864.

## To Correspondents.

ERRATA.—At page 687, col. 2, line 10 from bottom, before "essayist" omit "young;" p. 688, col. 2, line 37, for "Parois" read "Pavis."

## Patents.

*From Commissioners of Patents Journal, September 23rd.*

### GRANTS OF PROVISIONAL PROTECTION.

Adhesive mixture—2073—J. Allan.
Agricultural implements (Norwegian arrows)—2176—S. and W. Corbett.
Artificial stone, manufacture of—2116—P. A. L. de Fontainemoreau.
Bedsteads, cabinet—2180—A. Sharp.
Buttons, manufacture of—1619—G. Farmer.
Carriage wheels and axles—2239—B. Glover.
Coal, hewing or getting—2162—W. W. Burdon.
Cotton, &c., fastenings for bales of—2172—R. Shortrede.
Coupling apparatus—2191—R. D. Chatterton.
Elastic fluids, obtaining motive power from—2225—D. C. Knab.
Electric telegraphs—2217—H. W. Cook.
Engine, electro-magnetic—2158—A. M. J. Count de Molin.
Engines, preventing the escape of sparks from—2219—C. Moriarty.
Filtering apparatus—2178—T. H. Baker.
Fire-arms and ordnance, breech-loading—2199—T. Wilson.
Fuel, artificial—2229—R. F. Fairlie.
Gas valve and regulator—2152—E. M. Walter.
Ice, manufacture of—2235—A. C. Kirk.
Jute, preparation of—2233—A. Belhommet.
Looms—2135—W. Bullough.
Looms—2201—J. and R. Shorrock, and W. Mould.
Looms—2215—J. Holding.
Mules for spinning—2241—J. Banks.
Nautical instruments—2243—J. L. McLay and W. H. Thompson.
Ordnance—2227—C. Sanderson.
Papier maché, ornamentation of—2186—A. Smith.
Photographic impressions, &c., apparatus for cutting—2197—D Fruwirth.
Pins, &c., coating with metal—2150—T. Fowler.
Railway carriages, signalling between passengers and guard—2182—W. J. Curtis.
Railways, constructing and working—2207—P. W. Barlow.
Railway trains, signals in—2127—J. Packer.
Running rigging—2203—H. D. P. Cunningham.
Shirts—2108—J. Strouse.
Stair rods, &c., screw eyes for holding—2166—D. Greenfield.
Thrashing machines, fixed and portable combined—2211—C. J. Newbold.
Tobacco leaf, extracting juice from—2193—J. Fleming.
Umbrellas—2205—T. Restell.
Umbrellas, &c., construction of the frames of—2188—W. Clark.
Waste steam, heating water by means of—2213—D. Brodie.
Weights, use of magnets in overbalancing—2047—T. P. Tregaskis.

### PATENTS SEALED.

742. J. and J. Wild.
746. S. Bark, T. Attwood, and J. D. Robinson.
747. J. T. Stroud.
754. R. A. Brooman.
755. V. Dubourg.
758. T. W. Rammell.
762. E. Lever.
763. J. Symes.
766. E. Pace.
769. J. Lightfoot.
772. J. Rees.
776. E. Grether.
780. H. Holden & E. S. Forshaw.
782. A. Heald.
785. S. Trotman.
787. D. Treadwell.
790. T. Waller.
791. T. J. Smith.
793. J. Williamson.
797. H. Bayley, L. Newton, and J. Greaves.
798. W. Martin and J. Hodgson.
802. J. Prestwich, jun., and W. Brooks.
808. J. Bickerton.
816. C. Sanderson.
839. T. Bourne.
855. W. Clark.
862. G. Smith, jun.
953. J. H. Johnson.
965. A. V. Newton.
967. W. Ehrhardt.
993. D'H. Lomer.
1097. D. Clarke.
1125. T. H. Rees.
1706. T. Sharp.
1740. W. Spence.
1742. W. Parsons.
1822. N. Salamon.
1939. T. J. V. Roz.
1940. G. E. M. Gerard.

*From Commissioners of Patents Journal, September 27th.*

### PATENTS ON WHICH THE STAMP DUTY OF £50 HAS BEEN PAID.

1758. J. Adams.
2344. J. Graham.
2357. W. G. Creamer.
2365. W. Stableford.
2371. H. Plantrou, jun.
2376. J. Price.
2377. J. Jacob.
2398. G. Russell.
2417. D. McCallum.
2940. M. Henry.
2390. T. Bright and R. Mills.
2392. R. A. Brooman.

### PATENTS ON WHICH THE STAMP DUTY OF £100 HAS BEEN PAID.

2460. W. E. Newton.
2484. J. Lewis.
2476. L. Newton.
2503. J. C. Pearce.
2463. F. C. Bakewell.

## Registered Designs.

The Brunswick star jelly mould—4658—Messrs. Benham and Froud, 40, 41, and 42, Chandos-street, Strand, W.C.
Portable rotary hair-brushing machine—4659—James Beckett, Lamb's-buildings, Stephen's-green, Dublin; and Nathaniel Lewis Griffin, 17, Suffolk-street, Dublin.
The dress-preserving church book-box and kneeling hassock—4660—William Howard, jun., 23, Great Russell-street, Bloomsbury, W.C.